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General_SI_Simulation_Tutorial_1

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Introduction

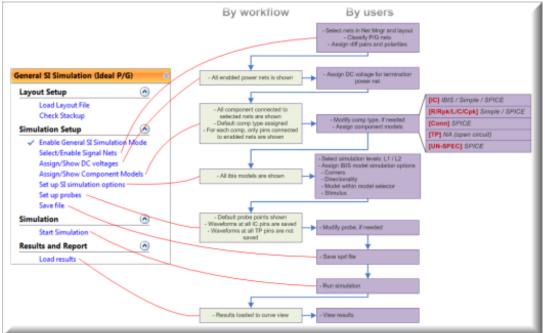
This tutorial introduces how to perform simulation with SPEED2000 General SI Simulation (Ideal P/G) workflow.

Overview

The newly introduced SPEED2000 **General SI Simulation (Ideal P/G)** workflow is for general purpose signal integrity simulations without considering the non-ideal power/ground effects. Specifically,

- Level 1 Trace and via couplings not considered, ideal P/G
- Level 2 Trace and via couplings considered, ideal P/G

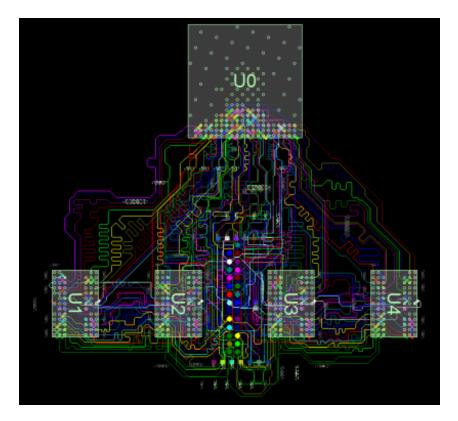
The main steps for simulation setup are shown in the following block diagram.



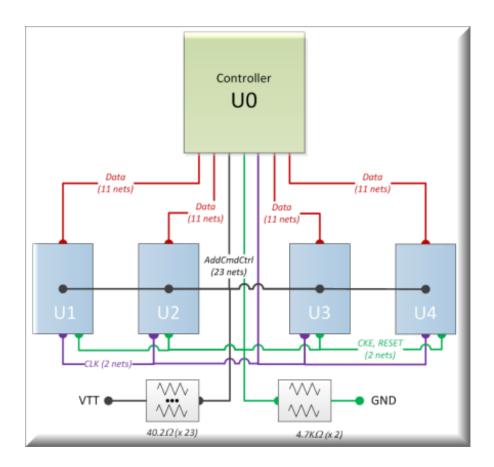
Tutorial Summary

The sample case used in this tutorial contains one controller and four DRAMs as shown below.

1



In this tutorial, all DDR nets are included in analysis. The topology is as the following figure shows.



The following three original files are used in this tutorial:

- Tutorial_GSI.spd layout file
- dram_IO.ibs IBIS file containing DRAM buffer models
- ctrl_IO.ibs IBIS file containing Ctrl buffer models
- They are all located in: <INSTALL_DIR>\SpeedXP\Samples\SPEED2000\General SI Simulation\Examples_PreSetup\

The completed sample and IBIS files (with step by step setup introduced in this tutorial) are also provided and located in:

<INSTALL_DIR>\SpeedXP\Samples\SPEED2000\General SI Simulation \Examples_PostSetup\Tutorial-1

General SI Simulation (Ideal P/G) workflow will lead user to:

- Setup simulation parameters
- Run simulation
- View simulation results

Layout Setup

This chapter describes how to load layout file and check stackup.

1. Launch SPEED2000 Generator , and select the General SI Simulation (Ideal P/G) workflow.



2. Click **Load Layout File** to load tutorial_GSI.spd. The workflow step **Check Stackup** is enabled.

Layout Setup Load Layout File Check Stackup

3. Click Check Stackup to open the Layer manager -> Stack Up window.

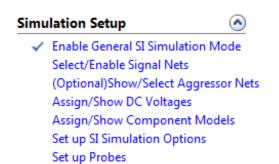
Løyer #	Color	Layer Icon	Layer Name	Thickness(Material	Conductivity(S	Pil-in Dielectric	Permittivity	Loss Tangent	Shape Name	T
			Signal\$_TOP	0.04064		5.959e+007		[1]	[0]	Shape\$TOP	0.
	_		Medium\$41	0.07747		0		3.9	0.035		
			Signal#L2_GND1	0.01524		5.959e+007		[4.09]	[0.035]	Shape\$L2	0.
			Medium\$43	0.0762		0		4.28	0.035		
			Signal9.3_SIG1	0.01524		5.959e+007		[4.09]	[0.035]	Shape\$L3_SIG1	٥.
			Medium\$45	0.14351		0		3.9	0.035		
			Signal\$.4_GND2	0.01524		5.959e+007		[4.09]	[0.035]	Shape\$1.4	0,
			Medium\$47	0.0762		0		4.28	0.035		
			Signal\$1.5_SIG2	0.01524		5.959e+007		[4.09]	[0.035]	Shape\$L5_SUG2	0.
			Medium\$49	0.142494		0		3.9	0.035		
			Signal#L6_GND3	0.03048		5.959e+007		[4.24]	[0.035]	Shape\$L6	0.
			Medum\$51	0.2032		0		4.58	0.035		
			Signal\$.7_PWR1	0.03048		5.959e+007		[4.32]	[0.035]	Shape\$L7_P	٥.
			Medum\$53	0.2413		0		4.06	0.035		
			Signal\$.8_PWR2	0.03048		5.959e+007		[4.32]	[0.035]	Shape\$L8_P	٥.
			Medium\$55	0.2032		0		4.58	0.035		
			Signal\$.11_GND4	0.03048		5.959e+007		[4.24]	[0.035]	Shape\$L11	0.
			Medium\$61	0.142494		0		3.9	0.035		
)			Signal\$.12_SIG3	0.01524		5.959e+007		[4.09]	[0.035]	Shape\$L12	0.
			Medium\$63	0.0762		0		4.28	0.035		
			Signal\$.13_GND5	0.01524		5.959e+007		[4.09]	[0.035]	Shape\$L13	٥.
			Medium\$65	0.144272		0		3.9	0.035		
			Signal 9, 14 SIG4	0.01524		5.959e+007		[4.09]	0.035]	Shape\$1.14	0,
otal Thick	ness: 2.0	0053e+000 mm						port Auto	View Materia Set Layer Special		

- 4. Check the stackup and edit as desired (no changes in this example).
- 5. Click **OK** to exit the window.

Simulation Setup

This chapter introduces how to set up simulation parameters for general SI simulation.

Click Enable General SI Simulation Mode to enable General SI simulation mode.



Save File

When enabled, a check mark \checkmark appears ahead the workflow step. And all other related steps are enabled.

Enabling Simulation Nets

To perform general SI simulation with SPEED2000, you'll need to select simulation nets first and define the differential pair property.

- Click Select/Enable Signal Nets in the Workflow pane. The Net Manager appears in the right side of the window.
- 2. Select to enable power net $\ensuremath{\text{VTT}}$.

July 2014

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Net Manager	×
Net:	- 🔎
Show Coupled Line	-
Net List (Sort all)	%Coupling 📥
🗌 📿 🌠 Unnamed Net(s)	2
🖃 🗹 🎽 PowerNets	
🗖 📿 💆 VDD	2
VTT 🗹	2
🗖 📿 🖊 VTT_REF	2 ≡
😑 🔲 📿 🌌 GroundNets	
🗖 📿 💆 GND	2
🗖 📿 🗖 A0	2
🗖 📿 📈 A1	2
🗖 📿 📈 A2	2
🗖 📿 🔀 A3	2

- 3. Choose all signal nets.
- 4. Right-click and choose **Enable Selected Nets** from the pop-up menu.

All selected nets are enabled.

The diff-pair and polarity are guessed out automatically.

- If the diff-pair is not guessed out, choose both positive and negative nets, right-click and choose Classify as diff pair to define it manually.
- If the polarity is not guessed out, right-click the positive net and choose Switch Polarity to define it manually.

Assigning DC Voltage

If power or ground nets are enabled as simulation nets, the DC voltage should be assigned before simulation.

- 1. Click Assign/Show DC Voltages in the Workflow pane. The Assign/Show DC Voltages window opens.
- 2. Input **0.75V** for **VTT** net like the following figure shows.

Net Name	Volt(V)	
Zm	Volt(V) 0.75	

3. Click OK .

Assigning Component Models

This section introduces how to assign models to all components.

Assigning IBIS Model to IC Component U0

- 1. Click Assign/Show Component Models in the Workflow pane. The Set up Component Models window opens.
- 2. Select to highlight component **U0** and click the **Edit Model** button.

Comp Name	Comp Type	Part Name	
U0	IC	Controller	
04	IC	Dram	
U1	IC	Dram	
U2	IC	Dram	
U3 R325	IC	Dram	
	R	R_0402_40_2 R_0402_40_2	
R326 R327	R	R_0402_40_2	
R328	R	R_0402_40_2	
	-		
		111	
ssign models			
Assign IBIS m	odels	Assign simple termination models Assign SPICE models	O Value 0
IBIS File: Copy IBIS N	fodel to	Edit Model	Component:
	fodel to	Edit Model	Component:
	fodel to	Edit Model	Component:
	fodel to	Edit Model	Component:
	todel to	Edit Model	Component:
	todel to	Edit Model	Component:
	todel to	Edit Model	Component:
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	todel to	Edit Model	Component:
	fodel to	Edit Model	Component:
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	todel to	Edit Model	Component:
	todel to	Edit Model	Component:

The Assign IBIS models window opens.

3. Browse to load the IBIS file ctrl_IO.ibs.

Assign IBIS models					□ ×
Layout Comp Name:	<u>uo</u>		IBIS Model File: IBIS Component:	x=3\SpeedXP\Samples\SPEED2000\General SI Simulation\Example_PreSetup\ctrl_IO.ibs DDR3_j	
LayoutPinName / NetName (Sort By ∠ Net)	IBISModelPinName / SignalName	Model Name			
M4 / A0					
M5 / A1					
K4 / A2					
L4 / A3					
K6 / A4					
K5 / A5					
J7 / A6					
J6 / A7 J5 / A8					
H5 / A9					
J3 / A10					
G5 / A11					
H4 / A12					-
Package Model :	lone O Pin RLC O	Package Model:		Clear All Recover OK Ca	ancel

The IBIS file is loaded.

- 4. Use Shift and Ctrl keys to select multiple nets A0 CKE, CS_B , ODT, RAS_B , $RESET_B$, and WE_B .
- 5. Click the icon is in the field of **Model Name** column and select **cmd_ctrl** from the pop-up window.

LayoutPinName / NetName (Sort By / Net)	1815ModelPinName / SignalName	Model Name		
M4 / A0				
M5 / A1				
K4 / A2				
L4 / A3				
L4 / A3 K6 / A4				
KS / AS				
17 / A6				
36 / A7				
35 / A8				
H5 / A9				
J3 / A10				
65 / A11		Pin Name	Signal Name	Model Name
H1 / A12		Not Connected		
F4 / A13		not corrected		data
G4 / A14				dk
L7 / BAO				and ctri
LG / BA1				data_odt100
HG / BA2				data_odtoff
P3 / CAS_8				GND
V3 / CKE				POWER
N5 / CLK_N				Ponds
N4/CLK_P				
P6 / CS_8				
81 / DM0				
13 / DM1				
P1/DM2				
AA2 / DM3				
E3 / DQ0		OK	Cancel	Model Selector name is italic and underlined.
C3/DQ1			Carice	The second second second with a second with a second second

6. Click **OK** .

The selected nets are assigned with the model **cmd_ctrl** .

LayoutPinName / NetName (Sort By Net)	IBISModelPinName / SignalName	Model Name
M4 / A0	M4 / A0	cmd_ctrl
M5 / A1	M5/A1	and_ctrl
K4 / A2	K4/A2	and_ctrl
L4 / A3	L4/A3	cmd_ctrl
K6 / A4	K6 / A4	cmd_ctrl
K5 / A5	K5 / A5	and_ctrl
37 / A6	J7 / A6	cmd_ctrl
J6 / A7	J6 / A7	cmd_ctrl
J5 / A8	J5 / A8	and_ctrl
H5 / A9	H5 / A9	cmd_ctrl
J3 / A10	J3 / A10	cmd_ctrl
G5 / A11	G5 / A11	and_ctrl
H4 / A12	H4/A12	and_ctrl
F4 / A13	F4/A13	cmd_ctrl
G4 / A14	G4/A14	and_ctrl
L7 / BA0	L7/8A0	cmd_ctrl
L6 / BA1	L6 / BA1	and_ctrl
M6 / BA2	M6 / BA2	and_ctrl
P3 / CAS_B	P3/CAS_B	cmd_ctrl
V3 / CKE	V3/OKE	and_ctrl
N5/CLK_N		
N4/CLK_P		
P6 / CS_8	P6 / CS_8	and_ctrl
B1 / DM0		

7. Repeat the above steps to assign nets CLK_N and CLK_P with the model clk .

L7 / BA0	L7 / BAO	cmd_ctrl	
L6 / BA1	L6 / BA1	cmd_ctrl	
M6 / BA2	M6 / BA2	cmd_ctrl	
P3 / CAS_B	P3/CAS_B	cmd_ctrl	
V3 / CKE	V3/CKE	cmd_ctrl	
NS / CLK_N	NS/CLK_N	dk	
N4/CLK_P	N4/CLK_P	dk	
P6 / CS_B	P6/CS_B	cmd_ctrl	
B1 / DM0			

8. Repeat the above steps to assign nets $DMO - DQS3_P$ with the model data . All nets are assigned with IBIS models.

1	3	
LayoutPinName /	IBISModelPinName /	Model Name
NetName (Sort By / Net)	SignalName	
M4 / A0	M4 / AD	cmd_ctrl
M5 / A1	M5/A1	cmd_ctrl
K4 / A2	K4/A2	cmd_ctrl
L4 / A3	L4/A3	cmd_ctrl
K6 / A4	K6 / A4	and_ctrl
KS / AS	K5 / A5	cmd_ctrl
37 / A6	17 / A6	cmd_ctrl
36 / A7	J6 / A7	cmd_ctrl
35 / A8	35 / A8	cmd_ctrl
H5 / A9	H5 / A9	cmd_ctrl
J3 / A10	J3 / A10	and_ctrl
G5 / A11	G5/A11	cmd_ctrl
H4 / A12	H4/A12	and_ctrl
F4/A13	F4/A13	and atri
G4 / A14	G4/A14	end etri
L7 / BA0	L7 / BA0	and atri
LG / BA1	L6/BA1	and atri
M6 / BA2	M6 / BA2	end etri
P3 / CAS_B	P3/CAS_B	and atri
V3 / CKE	V3/OE	and atri
N5/CLK N	N5 / CLK_N	dk
N4/CLK P	N4/CLK_P	dk
P6 / CS_8	P6/C5_8	cmd_ctrl
B1 / DM0	81/DM0	data
H3 / DM1	H3/DM1	data
P1/DM2	P1/DM2	data
AA2 / DM3	AA2 / DM3	data
E3 / DQ0	E3/DQ0	data
C3 / DQ1	C3/DQ1	data
F2 / DQ2	F2/DQ2	data
D1/DQ3	D1/DQ3	data
F1/004	F1/DQ4	data
111004	11004	0000

E1/DQ5	E1/DQ5	data
82 / DQ6	82/DQ6	data
D3 / DQ7	D3 / DQ7	cheta
G2 / DQ8	G2/DQ8	data
L1 / DQ9	L1/DQ9	data
G1 / DQ10	G1/DQ10	clata
K1/DQ11	K1/DQ11	data
L3 / DQ12	L3/DQ12	data
L2 / DQ13	L2/DQ13	data
J1 / DQ14	J1/DQ14	data
K3 / DQ15	K3/DQ15	data
M1 / DQ16	M1/DQ16	data
T3 / DQ17	T3/DQ17	data
N3 / DQ18	N3 / DQ18	dete
T1 / DQ19	T1/DQ19	data
R3 / DQ20	R3 / DQ20	data
T2 / DQ21	T2/DQ21	data
M2 / DQ22	M2 / DQ22	data
R1/DQ23	R1/DQ23	data
U1 / DQ24	U1/DQ24	data
AA1 / DQ25	AA1/DQ25	data
U2 / DQ26	U2 / DQ26	data
AA3 / DQ27	AA3 / DQ27	cheta
W1 / DQ28	W1/DQ28	data
Y3 / DQ29	Y3 / DQ29	data
W3 / DQ30	W3 / DQ30	data
Y1 / DQ31	Y1/DQ31	data
D2 / DQS0_N	D2 / DQ50_N	data
C2 / DQS0_P	C2/DQ50_P	data
J2 / DQS1_N	J2 / DQ51_N	data
H2/DQS1 P	H2/DOS1 P	data
P2 / DQS2_N	P2 / DQ52_N	data
N2 / DQS2_P	N2/DQS2_P	data
W2 / DQS3_N	W2/DQ53_N	data
V2 / DQS3_P	V2/DQ53_P	data
P5 / ODT	P5/ODT	cmd_ctrl
R5 / RAS_B	R5/RAS_B	cmd_ctrl
F3 / RESET_B	F3 / RESET_B	and atri
R4/WEB	R4/WEB	and atri
		0.00_001

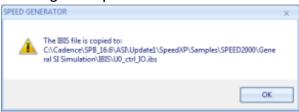
9. Check the newly generated models and click OK .

The Update IBIS File dialog box opens to confirm the changes.



10. Click Copy.

A dialog box opens.



11. Click \mathbf{OK} to create a new IBIS model.

The **Assign IBIS models** window quits and a pin matched component IBIS model for controller **U0** is generated, located in the sub-folder named **IBIS** under the project folder.

SpeedXP + Samples + SPEED2000 + Genera	al SI Simulation 🕨 IBIS	•
brary 🕶 Share with 👻 Burn New fo	older	
Name	Date modified	Туре
U0_ctrl_I0.ibs	12/3/2013 1:56 PM	IBS File

A green check mark appears ahead **U0** in the **Set up Component Models** window.

Set u	p Component	Models		- × 0	
	Comp Name	Comp Type	Part Name	A	
-	UO	10	Controller	=	
	U4	1C	Dram		
	U1	1C	Dram		
	U2	1C	Dram		
	U3	1C	Dram		
	R325	R	R_0402_40_2		
	R326	R	R_0402_40_2		
	R327	R	R_0402_40_2		
	R328	R	R_0402_40_2	*	
1				•	
	ssign models Assign 1815 m	odels	O Assign simple termination models	O Assign SPICE models O Value 0	
	IIS models IBIS File: Copy IBIS N	1815'(J.O_ct+1 4odel to	JO.bs Edit Model	Component: DDR3_j	

Assigning IBIS Model to IC Component U1

- 1. Select to highlight component **U1** and click the **Edit Model** button. The **Assign IBIS models** window opens.
- 2. Browse to load the IBIS file dram_IO.ibs.

Layout Comp Name:	UI		To use the IBIS model from AMM libraries, please click AMM Library IBIS Model File: 115peed/07/Samples/SPEED2000/(DR-650 Simulation/Examples_PreSetup)(ham_J0.bd)
			3815 Component: dram 16x4
Layou/PinName / NetName (Sort By / Net)	IBISModelPinName / SignalName	Model Name	
K3 / A0			
7 / A1			
3/A2			
C2 / A3			
8/ 44			
12 / A5 MB / A6			
M2 / A7			
NS / AS			
MG / A9			
H7 / A10			
M7 / A11			

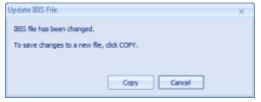
The IBIS file is loaded.

- 3. Repeat the steps described in the above section to assign nets A0 CKE, CS_B , ODT, RAS_B , $RESET_B$, and WE_B with the model INPUT.
- 4. Assign nets CLK_N and CLK_P with the model CLKIN .
- 5. Assign nets $DMO DQ_7$ with the model DQ.
- 6. Assign nets **DQS0_N** and **DQS0_P** with the model **DQS** . All nets are assigned with the IBIS models.

LayoutPinName / NetName (Sort By / Net)	IBISModelPinName / SignalName	Model Name
K3 / A0	K3 / A0	INPLIT
L7 / A1	L7/A1	INPUT
L3 / A2	L3/A2	INPLIT
K2 / A3	K2 / A3	INPUT
L8 / A4	L8 / A4	INPLIT
L2 / A5	L2/A5	INPUT
MB / A6	M8 / A6	INPUT
M2 / A7	M2 / A7	INPUT
NB / AB	N8 / A8	INPUT
M3 / A9	M3 / A9	INPUT
H7 / A10	H7/A10	INPUT
M7 / A11	M7/A11	INPLIT
K7 / A12	K7 / A12	INPUT
N3 / A13	N3/A13	INPLIT
N7 / A14	N7/A14	INPUT
32 / BAO	32/BAD	INPLIT
KB / BA1	K8 / 8A1	INPUT
33 / BA2	33/BA2	INPUT
G3 / CAS_B	G3/CAS_B	IMPUT
G9 / CKE	G9 / CKE	INPUT
G7 / CLK_N	G7/CLK_N	CLKIN
F7/CUK_P	F7/CLK_P	<u>a.kin</u>
H2 / CS_B	H2/CS_B	INPLIT
87 / DM0	87 / DM0	00
B3 / DQ0	B3 / DQ0	00
C7 / DQ1	C7/DQ1	00
C2 / DQ2	C2/DQ2	00
C8 / DQ3	C8 / DQ3	00
E3 / DQ4	E3 / DQ4	00
EB / DQ5	E8 / DQ5	DQ
D2 / DQ6	D2/DQ6	00
F7 (007	57 (007	00
E7 / DQ7	E7 / DQ7	00
D3 / DQS0_N	D3/DQ50_N	005
C3 / DQS0_P	C3/DQ60_P	DQS
G1 / ODT	G1/ODT	INPUT
F3 / RAS_B	F3/RAS_B	INPUT
N2 / RESET_B	N2/RESET_B	INPUT
H3 / WE_B	H3/WE_B	INPUT

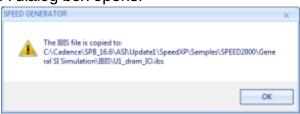
7. Check the newly generated models and click OK .

The **Update IBIS File** dialog box opens to confirm changes.



8. Click Copy.

A dialog box opens.



9. Click \mathbf{OK} to create a new IBIS model.

The **Assign IBIS models** window quits and a pin matched component IBIS model for controller **U1** is generated, located in the sub-folder named **IBIS** under the project folder.

SpeedXP + Samples + SPEED2000 +	General SI Simulation + IBIS	▼ 4 9 St
rary 🔻 Share with 🖛 Burn	New folder	
Name	Date modified	Туре
U0_ctrl_J0.ibs	12/3/2013 1:56 PM 12/3/2013 2:16 PM	IBS File IBS File

A green check mark appears ahead **U1** in the **Set up Component Models** window.

	Comp Name	Comp Type	Part Name	<u> </u>
~	UO	IC	Controller	
	U4	1C	Dram	
~	U1	IC .	Dram	
	U2	IC	Dram	
	U3	IC	Dram	
	R325	R	R_0402_40_2	
	R326	R	R_0402_40_2	
	R327	R	R_0402_40_2	
	R328	R	R_0402_40_2	
11				•
(sign models Assign 1815 mo	dels	O Assign simple termination models O Assign	SPICE models Value 0 Value
-18	IS models			
	IBIS File:	1B1S\U1_dra	1JO.bs Edit Model	Component: dram16x4
	Copy IBIS M	odel to		

Copying IBIS Model to U2, U3 and U4 from U1

- 1. Click the **Copy IBIS Model to** button. The **IBIS Copy** window opens.
- 2. Select to check the components U4 , U2 and U3 (uncheck U0).

Comp No	100			
	UD			-
	U4			
	U2			
	U3			
_				
-				
_				

3. Click **OK** .

All nets for component **U2**, **U3** and **U4** are assigned with IBIS models. A green check mark appears ahead components **U4**, **U2** and **U3** in the **Set up Component Models** window.

	Comp Name	Comp Type	Part Name			*
~	00	IC	Controller			
~	U4	IC	Dram			
~	U1	IC	Dram			
	U2	IC	Dram			
	U3	IC	Dram			
~	R325	R	R_0402_40_2			
~	R326	R	R_0402_40_2			
~	R327	R	R_0402_40_2			
	R328	R	R_0402_40_2			+
1				1	• • • • • • • • • • • • • • • • • • •	
-	ssign models					
0	Assign IBIS mo	dels	Assign simple termination models	Assign SPICE models	O Value □	
_	NS models					
-	us modes					
	IBIS File:	IBIS\U1_drar	_10.bs Edit Model		Component: dram16x4	
ſ	Copy IBIS M	odel to				

Defining Passive Component Value

The value of passive component is generated automatically by default. It is changeable. You can check and modify it as desired.

- 1. Select components R319 and R320 .
- 2. Input 4700ohm in the field of Value .

Comp Name	Comp Type	Part Name
R342	R	R_0402_40_2
R343	R	R 0402 40_2
R344	R	R_0402_40_2
R345	R	R_0402_40_2
R346	R	R_0402_40_2
R347	R	R_0402_40_2
R319	R	R_0402_4_7K
R320	R	R_0402_4_7K
R323	R	R_0402_80_6
e: Comp Type	is editable.	
ssign models-		

3. Click **OK** .

The Set up Component Models window quits.

SI Simulation Options Setup

This section introduces how to set up SI simulation options.

Click Set up SI Simulation Options in the Workflow pane.

The GeneralSI simulation setup -> GeneralSI Options pane appears at the bottom of the window.

ralSI Options Setup Probes									
mulation Configuration		Hod	els and Data patterns						
PJG and coupling options	Corner	Deta	Rate: 1	Sps Clack Perio	6 T = 2 mi	# of Bris: 10	Tmax: 2.67819	•	
	Этур	Cor	Pr/Name/NetFiame	1/O Selection	Transmitter 30 Model	Receiver IO Model	Stimulus Pattern	Stmuke Offset(s)	ut
Evel-1: Ideal P/G, single line		8	(IC) U0						
	OFest		AA1/DQ25	Un-assigned	data_odtoff	data_odtoff	3010303010	0	\$T
C Level-2: Ideal P/G, coupled lines	0.001		AA2/DH3	Un-assigned	dets_odtoff	data_odtoff	3010303010	0	IT
			AA3/DQ27	Un-assigned	data_odtoff	data_odteff	3018303010	0	17
	Oslow		81/DM0	Un-assigned	data_odtoff	data_odtoff	3010101010	0	3T
Ideal P/G option simulation			82/DQ6	Un-assigned	data_odtoff	data_odteff	3010303010	0	1T
			C2(DQS8_P	Un-assigned	data_odtoff	data_odtoff	3018303010	0	aT .
time step(ps): 20		-	DQ/DQS0_N	Un-assigned	data_pdtoff	data_odtoff	0101010101	0	IT
Counting (NA) 5			D1/DQ3	Un-assigned	data_odtoff	data_odteff	3018303010	0	17
Coupling (%): 5			C3/DQ1	Un-assigned	data_pdtoff	data_odtoff	3010101010	0	ST.
Rice Time(pc): 300			03/DQ7	Un-assigned	data_odtoff	data_odtoff	3010303010	0	TT.
Land Landborn Land			ENDOS	its-acciment	data officity	data odioff	1010101010	0	ST

The pane contains two tabs: GeneralSI Options and Setup Probes .

General SI Options

- 1. Input the following models and data parameters:
 - Data Rate : 1.333Gbps
 - # of Bits : 10
 - Tmax : 15ns

_	- Models and D	ata natterne										
	Prodeb drid b	ous pouch is	,									
										 	_	
	Data Rate:	1.333	Gbps	Clock Period: T =	1.500375 NS	# of Bits:	10	Tmax:	15	ns		
											-	

2. Click the column title **CompPinName/Netname** to reorder the nets alphabetically.

CompPinName/NetName(Sor NetName)		I/O Selection	Transmitter IO Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	UI
	[IC] U0						
	M4/A0	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	M5/A1	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	K4/A2	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	L4/A3	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	K6/A4	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	K5/A5	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	J7/A6	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	J6/A7	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	J5/A8	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	H5/A9	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	J3/A10	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	G5/A11	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	H4/A12	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	F4/A13	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	G4/A14	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	L7/BA0	Un-assigned	cmd_ctrl	cmd_ctrl	1010101010	0	1T
	16/BA1	Hn-assigned	and and	and and	1010101010	0	17

U0 Parameters Setup

- 1. Select to highlight the nets $A0 WE_B$ under U0.
- 2. Click the icon is in the field of **I/O Selection** column and select **Output** from the drop-down list.

Compl NetNa		I/O Selection	Transmitter 10 Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	τιτ
	W3/DQ30	Output	 data_odtoff 		10 10 10 10 10	0	117
	Y1/DQ31	Un-assigned	data_odtoff		1010101010	0	រា
⊕	C2/DQS0_P	Input	data_odtoff		1010101010	0	
	D2/DQS0_N	Output	data_odtoff		0101010101	0	117
Ð	H2/DQS1_P	Output	data_odtoff		1010101010	0	11
L	J2/DQS1_N	Output	data_odtoff		0101010101	0	1T
⊕	N2/DQS2_P	Output	data_odtoff		1010101010	0	
	P2/DQ52_N	Output	data_odtoff		0101010101	0	117
Ð	V2/DQ53_P	Output	data_odtoff		1010101010	0	1T
L	W2/DQS3_N	Output	data_odtoff		0101010101	0	117
	PS/ODT	Output	and_ctrl		10 10 10 10 10	0	117
	R5/RAS_B	Output	and_ctrl		10 10 10 10 10	0	117
	F3/RESET_B	Output	and_ctrl		1010101010	0	1T
	R4/WE_B	Output	cmd_ctrl		1010101010	0	17

- 3. Select to highlight nets $DMO DQS3_N$.
- 4. Click the icon 토 in the field of **UI** column and input **0.5T** in the field.

Compl NetNa	PinName/NetName(Sor	I/O Selection	Transmitter 10 Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	ur
	R 1/DQ23	Output	data_odtoff		10 10 10 10 10	0	1T
	U1/DQ24	Output	data_odtoff		1010101010	0	1T
	AA1/DQ25	Output	data_odtoff		10 10 10 10 10	0	1T
	U2/DQ26	Output	data_odtoff		1010101010	0	IT
	AA3/DQ27	Output	data_odtoff		1010101010	0	1T
	W1/DQ28	Output	data_odtoff		1010101010	0	11
	Y3/DQ29	Output	data_odtoff		1010101010	0	11
	W3/DQ30	Output	data_odtoff		1010101010	0	11
	Y1/DQ31	Output	data_odtoff		1010101010	0	11
⊕	C2/DQS0_P	Output	data_odtoff		1010101010	0	0.5T
L	D2/DQS0_N	Output	data_odtoff		0101010101	0	1T
Ð	H2/DQS1_P	Output	data_odtoff		1010101010	0	1T
L	32/DQS1_N	Output	data_odtoff		0101010101	0	11
Ð	N2/DQS2_P	Output	data_odtoff		10 10 10 10 10	0	1T
L	P2/DQS2_N	Output	data_odtoff		0101010101	0	iT
B	V2/DQ53_P	Output	data_odtoff		10 10 10 10 10	0	1T
L	W2/DQ53_N	Output	data_odtoff		0101010101	0	1T
	DEPORT	Output	and and		1010101010	0	17

U1 Parameters Setup

- 1. Select to highlight nets DM0 DQS0_N under U1.
- 2. Click the icon 토 in the field of **I/O Selection** column and select **Input** from the drop-down list.

Compl NetNa	PinName/NetName(Sor	I/O Selection	Transmitter IO Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	-ut
⊕	F7/CLK_P	Input		CLKIN_1333			
_	G7/CLK_N	Input		CLKIN_1333			
	H2/CS_B	Input		INPUT_1333			
	87/DM0	Un-assigned	DQ5_34_1333	DQS_34_1333	1010101010	0	1T
	83/DQ0	Un-assigned	DQ5_34_1333	DQS_34_1333	10 10 10 10 10 10	0	1T
	C7/DQ1	Input	DQ5_34_1333	DQS_34_1333	1010101010	0	
	C2/DQ2	Output	DQ5_34_1333	DQS_34_1333	1010101010	0	1T
	C8/DQ3	Un-assigned	DQ5_34_1333	DQ5_34_1333	1010101010	0	11
	E3/DQ4	Un-assigned	DQ5_34_1333	DQS_34_1333	1010101010	0	1T
	E8/DQ5	Un-assigned	DQ5_34_1333	DQS_34_1333	1010101010	0	117
	D2/DQ6	Un-assigned	DQ5_34_1333	DQS_34_1333	1010101010	0	117
	E7/DQ7	Un-assigned	DQ5_34_1333	DQS_34_1333	1010101010	0	117
⊕	C3/DQ50_P	Un-assigned	DQ5_34_1333	DQS_34_1333	1010101010	0	117
-	D3/DQ50_N	Un-assigned	DQ5_34_1333	DQS_34_1333	0101010101	0	117
	G1/ODT	Input		INPUT_1333			
	F3/RAS_B	Input		INPUT_1333			
	N2/RESET_B	Input		INPUT_1333			
	HOARE B	Innut		TND (T 1333			

- 3. Assign the nets **DM0 DQ7** with the **Receiver IO Model DQ_34_ODT60_1333** from the drop-down list.
- 4. Assign the nets DQS0_P DQS0_N with Receiver IO Model DQS_34_ODT60_1333 from the drop-down list.

	pPinName/NetName(Sor Name)	1/O Selection	Transmitter IO Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	ut
	87/DM0	Input		DQS_34_ODT60			
	B3/DQ0	Input		DQS_34_ODT60			
	C7/DQ1	Input		DQS_34_ODT60			
	C2/DQ2	Input		DQS_34_ODT60			
	C8/DQ3	Input		DQS_34_ODT60			
	E3/DQ4	Input		DQS_34_ODT60			
	E8/DQ5	Input		DQS_34_ODT60			
	D2/DQ6	Input		DQS_34_ODT60			
	E7/DQ7	Input		DQS_34_ODT60			
⊕	C3/DQS0_P	Input		DQS_34_00T60			
L	D3/DQS0_N	Input		DQS_34_00T60			
	G1/ODT	Input		INPUT_1333			
	F3/RAS_B	Input		INPUT_1333			
	N2/RESET_B	Input		INPUT_1333			
	H3/WE_B	Input		INPUT_1333			
8	[IC] U2						
	K3/A0	Input		INPUT_1333			
	17/11	Incest		TMOLET 1999			

U2 Parameters Setup

- 1. Select to highlight nets DM1 DQS1_N under U2 .
- 2. Click the icon 토 in the field of **I/O Selection** column and select **Input** from the drop-down list.
- 3. Assign the nets **DM1 DQ15** with the **Receiver IO Model DQ_34_ODT60_1333** from the drop-down list.
- 4. Assign the nets **DQS1_P DQS1_N** with **Receiver IO Model DQS_34_ODT60_1333** from the drop-down list.

Comp NetNa	PinName/NetName(Sor	1/O Selection	Transmitter IO Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	Tut .
⊕	F7/CLK_P	Input		CLKIN_1333			
-	G7/CLK_N	Input		CLKIN_1333			
	H2/CS_B	Input		INPUT_1333			
	87/DM1	Input		DQS_34_ODT60_1333			
	83/DQ8	Input		DQS_34_ODT60_1333			
	C7/DQ9	Input		DQS_34_ODT60_1333			
	C2/DQ10	Input		DQS_34_ODT60_1333			
	C8/DQ11	Input		DQS_34_ODT60_1333			
	E3/DQ12	Input		DQS_34_ODT60_1333			
	E8/DQ13	Input		DQS_34_ODT60_1333			
	D2/DQ14	Input		DQS_34_ODT60_1333			
	E7/DQ15	Input		DQS_34_ODT60_1333			
₽	C3/DQS1_P	Input		DQS 34 ODT60 1333			
-	D3/DQS1_N	Input		DQS 34 ODT60 1333			
	G1/ODT	Input		INPUT_1333			
	F3/RAS_B	Input		INPUT_1333			
	N2/RESET_B	Input		INPUT_1333			
	H3/ME B	Innut		TNPLIT 1333			

U3 Parameters Setup

- 1. Select to highlight nets DM2 DQS2_N under U3.
- 2. Click the icon 토 in the field of **I/O Selection** column and select **Input** from the drop-down list.
- 3. Assign the nets **DM2 DQ23** with the **Receiver IO Model DQ_34_ODT60_1333** from the drop-down list.
- Assign the nets DQS2_P DQS2_N with Receiver IO Model DQS_34_ODT60_1333 from the drop-down list.

Compi NetNa	PinName/NetName(Sor me)	I/O Selection	Transmitter IO Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	UI
0	F7/CLK_P	Input		CLKIN_1333			
_	G7/CLK_N	Input		CLKIN_1333			
	H2/CS_B	Input		INPUT_1333			
	B7/DM2	Input		DQS_34_ODT60_1333			
	B3/DQ16	Input		DQS_34_ODT60_1333			
	C7/DQ17	Input		DQS_34_ODT60_1333			
	C2/DQ18	Input		DQS_34_ODT60_1333			
	C8/DQ 19	Input		DQS_34_ODT60_1333			
	E3/DQ20	Input		DQS_34_ODT60_1333			
	E8/DQ21	Input		DQS_34_ODT60_1333			
	D2/DQ22	Input		DQS_34_ODT60_1333			
	E7/DQ23	Input		DQS_34_ODT60_1333			
₽	C3/DQS2_P	Input		DQS_34_ODT60_1333			
	D3/DQS2_N	Input		DQS_34_00T60_1333			
	G1/ODT	Input		INPUT_1333			
	F3/RAS_B	Input		INPUT_1333			
	N2/RESET_B	Input		INPUT_1333			
	H3/ME B	Inout		INPLIT 1333			

U4 Parameters Setup

- 1. Select to highlight nets DM3 DQS3_N under U4.
- 2. Click the icon 토 in the field of **I/O Selection** column and select **Input** from the drop-down list.
- 3. Assign the nets **DM3 DQ31** with the **Receiver IO Model DQ_34_ODT60_1333** from the drop-down list.
- Assign the nets DQS3_P DQS3_N with Receiver IO Model DQS_34_ODT60_1333 from the drop-down list.

Compl NetNa	PinName/NetName(Sor	1/O Selection	Transmitter IO Model	Receiver IO Model	Stimulus Pattern	Stimulus Offset(s)	UI
⊕	F7/CLK_P	Input		CLKIN_1333			
_	G7/CLK_N	Input		CLKIN_1333			
	H2/CS_B	Input		INPUT_1333			
	87/DM3	Input		DQS_34_00T60_1333			
	B3/DQ24	Input		DQS_34_ODT60_1333			
	C7/DQ25	Input		DQS_34_00T60_1333			
	C2/DQ26	Input		DQS_34_00T60_1333			
	C8/DQ27	Input		DQS_34_00T60_1333			
	E3/DQ28	Input		DQS_34_00T60_1333			
	E8/DQ29	Input		DQS_34_00T60_1333			
	D2/DQ30	Input		DQS_34_00T60_1333			
	E7/DQ31	Input		DQS_34_00T60_1333			
⊕	C3/DQS3_P	Input		DQS 34 ODT60 1333			
-	D3/DQS3_N	Input		DQS_34_ODT60_1333			
	G1/ODT	Input		INPUT_1333			
	F3/RAS_B	Input		INPUT_1333			
	N2/RESET_B	Input		INPUT_1333			
	H3AVE B	Innut		INPLIT 1333			

5. Click **OK** to save all settings.

Probes Setup

1. Click **Set up Probes** in the **Workflow** pane.

The **GeneralSI simulation setup -> Setup Probes** pane appears at the bottom of the window.

Concert Chairman de Lie	a cature of Cature	- Orabasi
GeneralSI simulatio		Probes
GeneralSI Options	Setup Probes	
Component Name		PinName,NetName
🗃 🛃 (pc) uo		
		AA1/0Q25
		AA2/DH3
2		AA3/DQ27
2		81/DM0
888		82/DQ6
0		C2/0Q50_P
		D2/DQ50_N
		01/003
Ø		C3/DQ1
-		

You can also open the pane by clicking the **Setup Probes** tab in the above section. In this example, keep all the probes checked.

- 2. Go back to the **GeneralSI simulation setup -> GeneralSI Options** pane.
- 3. Check all models and click **OK** to exit the pane.

Saving File

When all settings are complete, you can:

1. Click **Save File** in the **Workflow** pane to save the .spd files. A message window opens for you to confirm the selections.

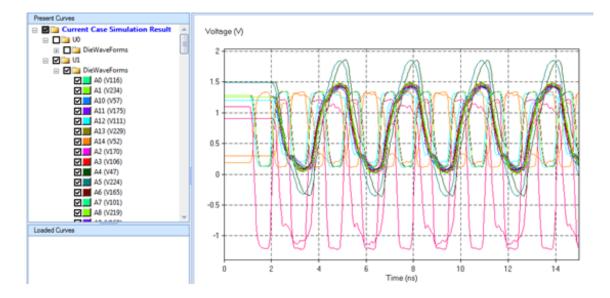


2. Click **OK** with the default settings.

Simulation and Results

Click Start Simulation in the Workflow pane to perform simulation.

When simulation completes, the result waveforms are shown below.



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